

Vallicula multiformis Rankin, 1956 (Ctenophora, Platyctenida): first record from the Indian Ocean

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Abstract: The benthic ctenophore *Vallicula multiformis* Rankin, 1956 is recorded for the first time in the Arabian Sea, from the Gulf of Kutch, west coast of India in March 2013. This occurrence represents a remarkable extension of its geographic distribution that until now included only known the Pacific and Atlantic oceans.

Key words: ctenophore, India, west coast, Gulf of Kutch, Gujarat

The Platyctenida, an order of ctenophores that includes the benthic species, has 47 species (Mills 2013). Most of them have restricted geographical distributions, limited to their respective type localities. *Vallicula multiformis* Rankin, 1956 (family Coeloplanidae) is an exception. The species was originally described from Jamaica (Rankin 1951) and then was recorded from Brazil (Marcus 1957; Oliveira and Migotto 2007), Bermuda (Freeman 1967), Madeira (Wirtz 1998), California USA (Mills and Haddock 2007), the Canary Islands and Cuba (Moro *et al.* 2011). Mills and Haddock (2007) also cited an occurrence of the species from Hawaii (USA), but the presence of *V. multiformis* in Hawaii was only formally reported by Carlton and Eldredge (2009) and was considered as non-indigenous to Hawaiian waters. Carlton and Eldredge also reported that *V. multiformis* may reach high population densities, and they also briefly commented on a possible vector of introduction. Informal reports of the species, with photographic records, were made from Florida, USA, by Hebecca Helm (pers. comm.) and from Germany, by Michael Eitel (pers. comm.).

The platyctenids *Coeloplana indica* Devanesen & Varadraj, 1942, *C. krusadiensis* Devanesen & Varadraj, 1942 and *C. tattersalli* Devanesen & Varadraj, 1942 were described from Krusadai Island and Gulf of Mannar, India, by Devanesen and Varadraj (1942). *Ctenoplana bengalensis* Gnanamuthu & Nair, 1947 was newly described from Madras (Gnanamuthu and Nair 1947) but may be the same species reported by Menon (1927). Recently, *Coeloplana meteoris* Thiel, 1968 has reported from India by Venkatraman *et al.* (2012).

This paper records the first record of the *Vallicula*

multiformis from the Indian Ocean (Figure 1). The species' geographic distribution includes the Atlantic, Northeastern Pacific Ocean, and Northern Indian oceans.

Specimens were recorded from Boria (22°25'12.65" N, 069°13'15.24" E) and Adasaba (22°23'58.43" N, 069°12'52.74" E) Islands near to Poshitra, Gujarat on 30 and 31 March 2013. All specimens were observed on the algae *Halimeda opuntia* (Figure 2A). Collected species, and the host algae, were placed in a plastic container filled with sea water. Four specimens measuring between 6–10 mm wide were collected during a daytime survey from the shore of Boria Island were photographed in the natural habitat on algae along with the sea slug *Elysia pusilla* (Bergh, 1872) (Figure 2B). After observing their behavior, the specimens were preserved in 4% formaldehyde with sea water without sedation. Voucher specimens were deposited in the collection the Bombay Natural History Society (BNHS-Cteno-1).

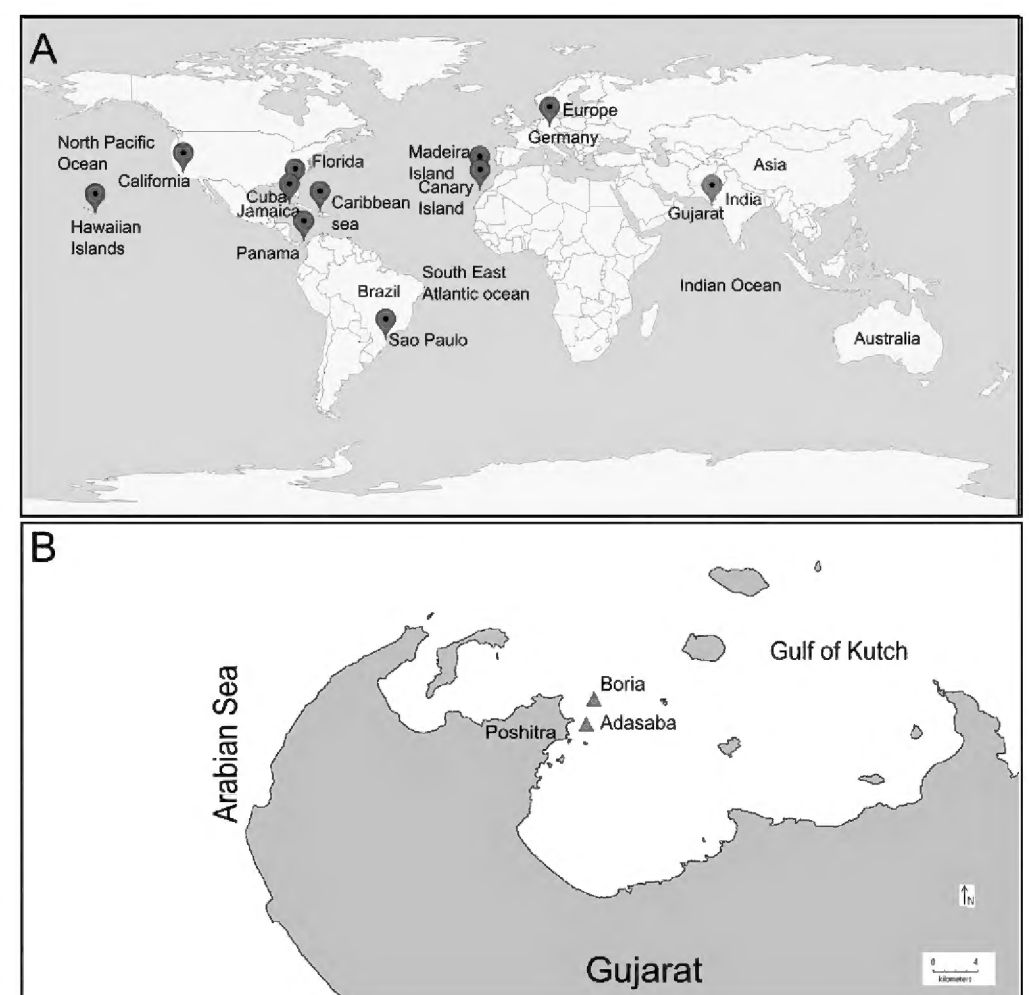


Figure 1. A: Worldwide distribution of *Vallicula multiformis*. B: Study area: Gulf of Kutch and reefs of Boria and Adasaba islands.

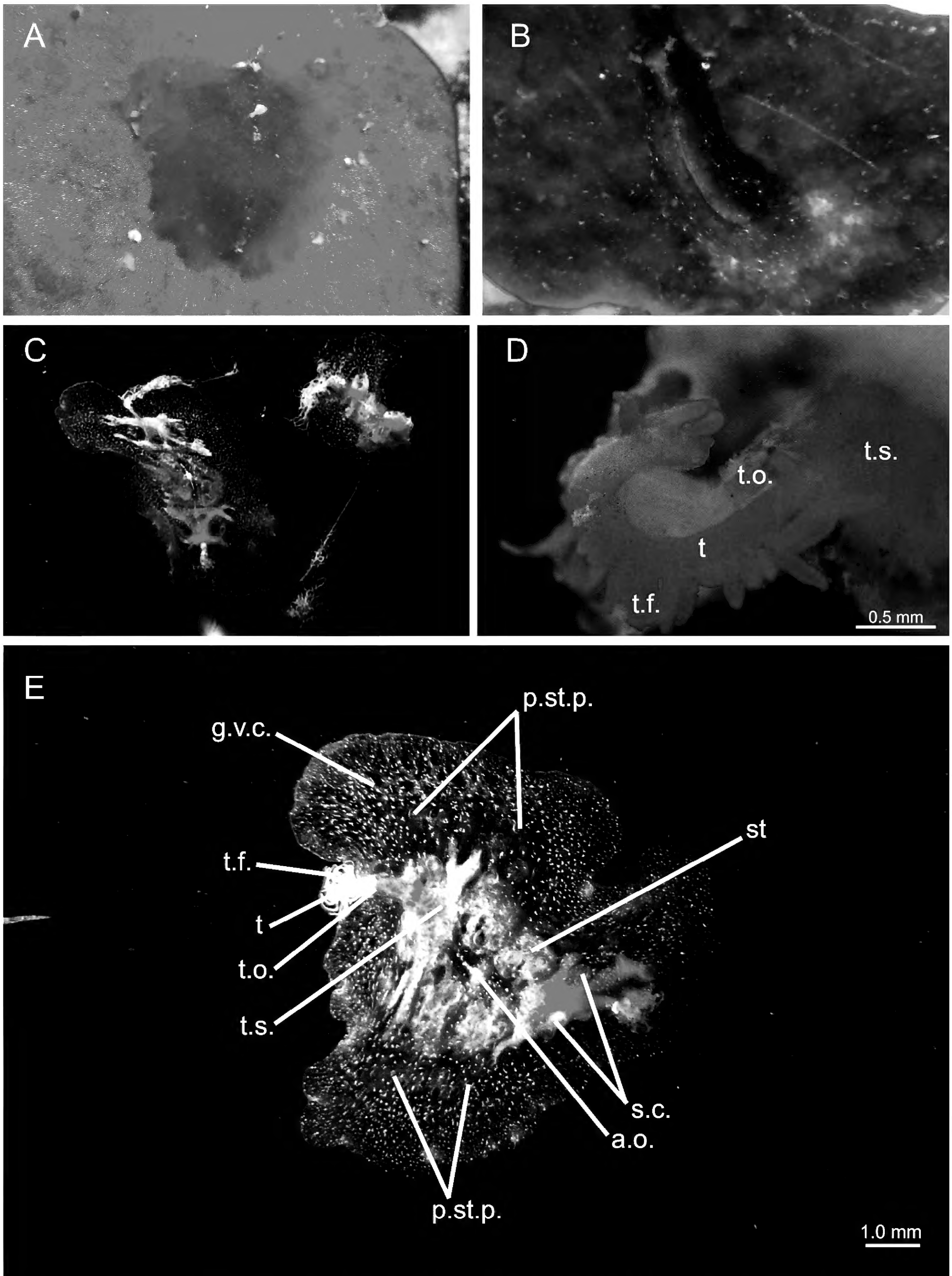


Figure 2. **A:** *Vallicula multiformis* on *Halimeda opuntia* algae found in sessile phase. **B:** Similar looking saccoglosan *Elysia pusilla* found on same algae. **C:** Specimens showing fully extended tentacles during movement. **D:** Tentacle and tentacular filaments. **E:** Aboral view of the specimen showing anastomosed canals and blind ended branches. Legend: t.f., tentacular filaments; t, tentacle; t.o., tentacular sheath opening; t.s., tentacle sheath; g.v.c., gastrovascular canals; p.st.p., parastomial papillae; st, stomach; s.c., spherical chamber; a.o., apical organ.

Specimens were identified using the identification key by Oliveira et al. (2007) and on the original description of *V. multiformis* by Rankin (1956). Laboratory observations revealed movements by gliding, creeping, and floating (Figure 2C). The general morphology is as described by Rankin (1956).

Tentacles are long (almost double the total body length). Gastrovascular canals end blindly near the body margins; this is one of the notable characteristics of the genus *Vallicula*. The color is translucent green with white spots scattered all over the body. Light brown spots are visible only under low reflective light (Figure 2D–E). Discoloration was observed after preservation.

In the natural state during daytime, *V. multiformis* was sessile, without any movement, and appeared similar to a flatworm or a coeloplana. After 5–6 hours in the collection containers with the algae *Halimeda opuntia*, the animals detached from the algae and were found to be creeping on the walls of the container and changing body forms. Similar observations were reported by Rankin (1956).

Rankin (1956) mentioned that *V. multiformis* was abundant in June to September and January to March and sparsely found in May, October and early December. In this study, animals were observed from March–April when the water temperature was ca. 29°C.

Vallicula multiformis has been observed in waters of the Caribbean, Europe and southeast Atlantic, in warm water regions (Mills 2013). These are benthic animals living on variety substrates such as algae (*Acanthophora spicifera*, *Caulerpa sertularioides*, *Padina* spp. and *Sargassum* spp.; Rankin 1956; Marcus 1957; Wirtz 1998), byozoans (*Bugula* spp.; Marcus 1957), hydroids (Rankin 1956; Marcus 1957), holothurians (Rankin 1956) including *Synaptula* spp. (Marcus 1957), and ascidians (Rankin 1956).

In this study, specimens were exclusively found on the algae *Halimeda opuntia*.

This paper reports *Vallicula multiformis* for the first time from the coast of India. This species' presence here may be due to natural, passive dispersal with the currents or may represent an introduction due to shipping (i.e., ballast water or fouling; Carlton and Eldredge, 2009). Molecular studies may offer insights into the origin of this Indian population.

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LITERATURE CITED

Carlton, J. and L. Eldredge. 2009. Marine bioinvasions of Hawaii: the introduced and cryptogenic marine and estuarine animals

and plants of the Hawaiian Archipelago. *Bishop Museum Bulletins in Cultural and Environmental Studies* 4: 202 pp. (<http://hbs.bishopmuseum.org/pubs-online/pdf/bces4.pdf>)

- Devanesen, D.W. and S.S. Varadarajan. 1939. On *Coeloplana* sp. discovered by Prof. W. M. Tattersall at Krusadai Island, Marine Biological Station, Gulf of Mannar. *Indian Academy of Sciences* 4: 157–159.
- Devanesen, D.W. and S.S. Varadarajan. 1942. On three new species of *Coeloplana* found at Krusadai Island, Marine Biological Station, and Gulf of Mannar. *Journal of Madras University* 14(2): 181–88.
- Freeman, G. 1967. Studies on the regeneration in the creeping ctenophore, *Vallicula multiformis*. *Journal of Morphology* 123: 71–83 (doi: 10.1002/jmor.1051230107).
- Gnanamuthu, C.P. and R.V. Nair. 1947. *Ctenoplana bengalensis* sp. nov. from the Madras plankton. *Proceedings of Indian Academy of Sciences (B)* 27: 153–160 (http://www.ias.ac.in/j_archive/procb/27/6/153-160/viewpage.html).
- Marcus, E.B.R. 1957. *Vallicula multiformis* Rankin, 1956, from Brazil. *Boletim do Instituto Oceanográfico* 7(1–2): 87–91 (doi: 10.1590/S0373-55241956000100004).
- Menon, K.R. 1927. Preliminary notes on *Ctenoplana indica*, n. sp.; 190 pp., in: *Proceedings of 14th Indian Science Congress*. Lahore: Indian Science Congress.
- Mills, C. 2013. *Vallicula multiformis* Rankin, 1956. World Register of Marine Species (WoRMS). Accessible at <http://www.marinespecies.org/aphia.php?p=taxdetails&id=106403>. Captured on 06 June 2013.
- Mills, C.E. and S. Haddock. 2007. Ctenophora; pp.189–199, in: J.T. Carlton (ed.). *The Light and Smith Manual: Intertidal Invertebrates from Central California to Oregon*. Oakland: University of California Press.
- Mills, C.E. *Phylum Ctenophora: List of All Valid Species Names*. Accessible at <http://faculty.washington.edu/cemills/Ctenolist.html>. Captured on 15 May 2012.
- Moro, L.; R. Riera; G. Matsumoto and J. Ortea. 2011. Primera cita de *Vallicula multiformis* Rankin, 1956 (Ctenophora: Platyctenida) para Canarias y Cuba. *Revista de la Academia Canariense de Ciencias* 22(3): 79–84 (<http://biodiversitylibrary.org/page/42345607>).
- Oliveira, O., H. Mianzan, A.E. Migotto and A.C. Marques. 2007. Identification key for the ctenophores from Brazilian coast. *Biota Neotropica* 7(3): 341–350 (doi: 10.1590/S1676-06032007000300034).
- Oliveira, O.M.P. and A.E. Migotto. 2007. Que bicho estranho! Animal marinho de morfologia aberrante é encontrado no litoral paulista. *Ciência Hoje* 236: 72–73.
- Rankin, J.J. 1951. A new platyctenid ctenophore from Jamaica. *Nature* 168: 1047 (doi: 10.1038/1681047a0).
- Rankin, J. J. 1956. The structure and biology of *Vallicula multiformis* gen. et sp. nov., a platyctenid ctenophore. *Journal of Linnean Society Zoology* 43(289): 55–71 (doi: 10.1111/j.1096-3642.1956.tb02507.x).
- Venkatraman, K., C. Raghunathan, R. Raghuraman, and C.R. Sreeraj. 2012. *Marine Biodiversity*. Kolkata: Zoological Survey of India.
- Wirtz, P. 1998. Twelve invertebrate and eight fish species new to the marine fauna of Madeira, and a discussion of the zoogeography of the area. *Helgoländer Meeresuntersuchungen* 52: 197–207 (doi: 10.1007/BF02908748).

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